POST-SHUTDOWN-DATA

Offline EM, MET Distributions

THANKS to
Jan Stark,
Sophie Trincaz-Duvoid, Patrice Verdier

post-shutdown runs

24 Nov:	**run 185576 → BLS power-plug problem**
25/26 Nov:	run 185746
	run 185747
	run 185748
	run 185750
	run 185751
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27 Nov:	run 185797
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28 Nov:	run 185825
	run 185829
	run 185831

luminosity estimation 485 nb^{-1}= 77 nb^{-1}+ 46 nb^{-1} + 362 nb^{-1}
processed with p14.05.02
check of calorimeter performance with
⇒ electrons (Jan Stark - Grenoble)
⇒ missing-Et (Sophie Trincaz-Duvoid – Paris, Patrice Verdier - Orsay)

pre-shutdown: using em-candidates

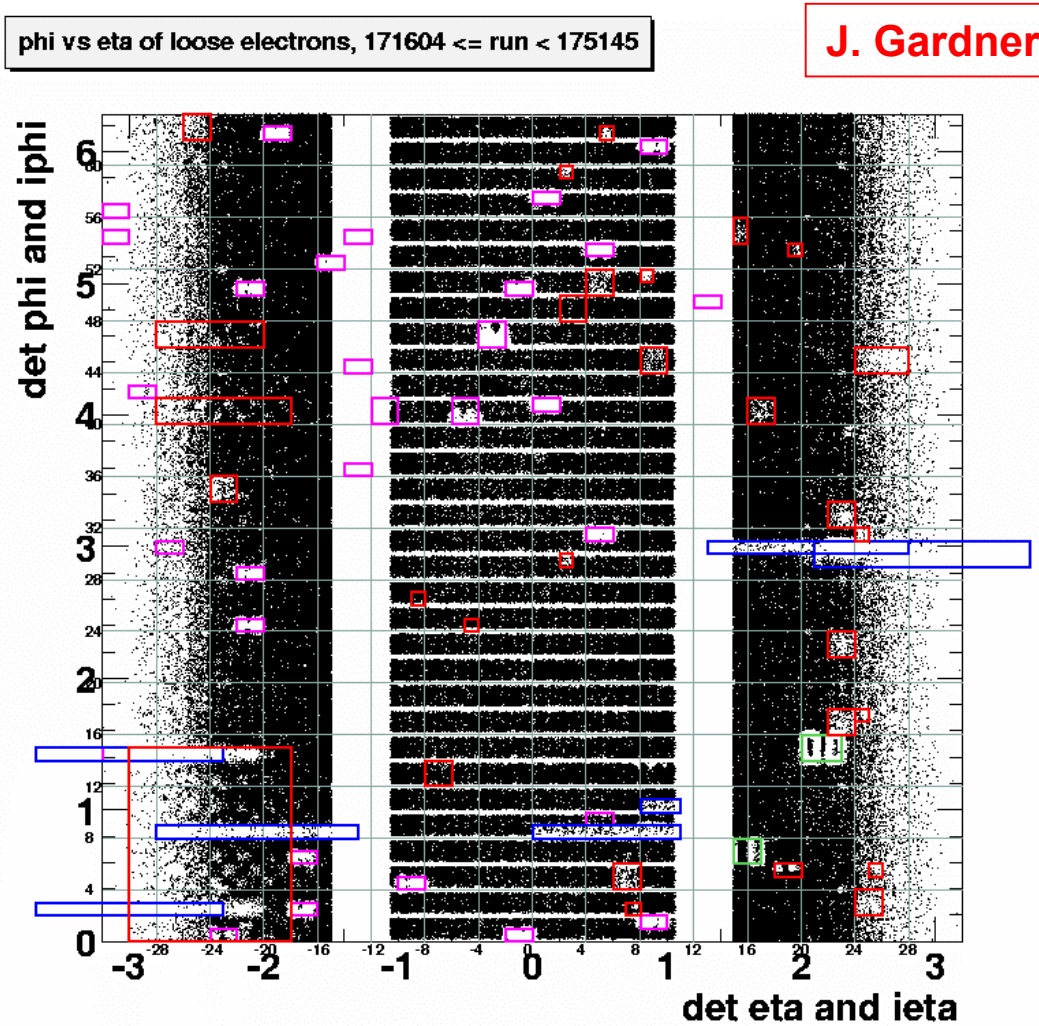
Electron candidates, with their small size in η/ϕ have proven to be a valuable tool to spot BLS problems in the calorimeter.

η/ϕ distribution of all candidate EM objects id=|10,11|:

p_T > 25 GeV (15 GeV post)
EM fraction > 0.9
isolation < 0.15
HMx8 < 20
in fiducial region

pink boxes: tower two problem
blue boxes: energy sharing problem
green boxes: cable swap
red boxes: not understood

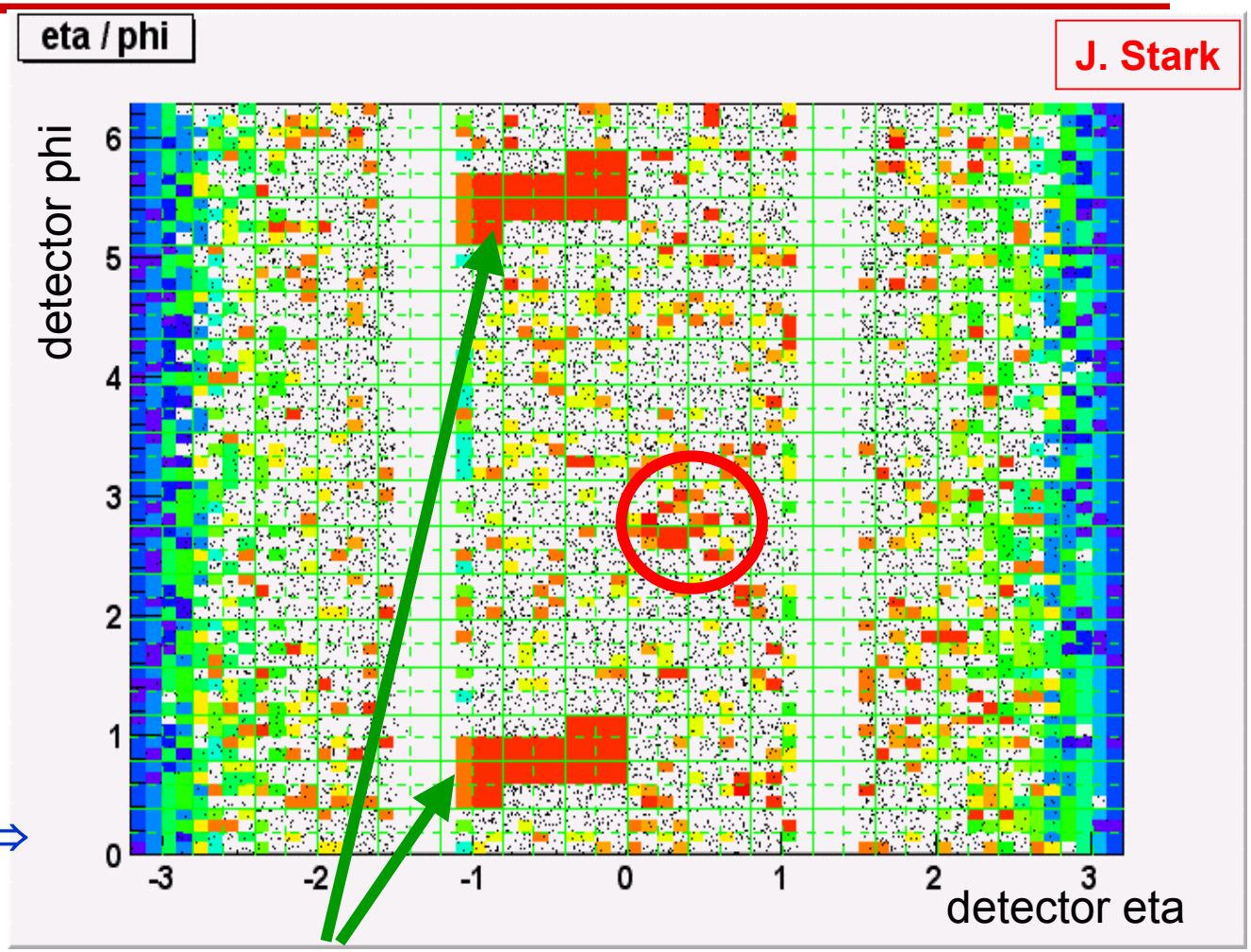
J. Gardner



Run 185576: BLS-power plug

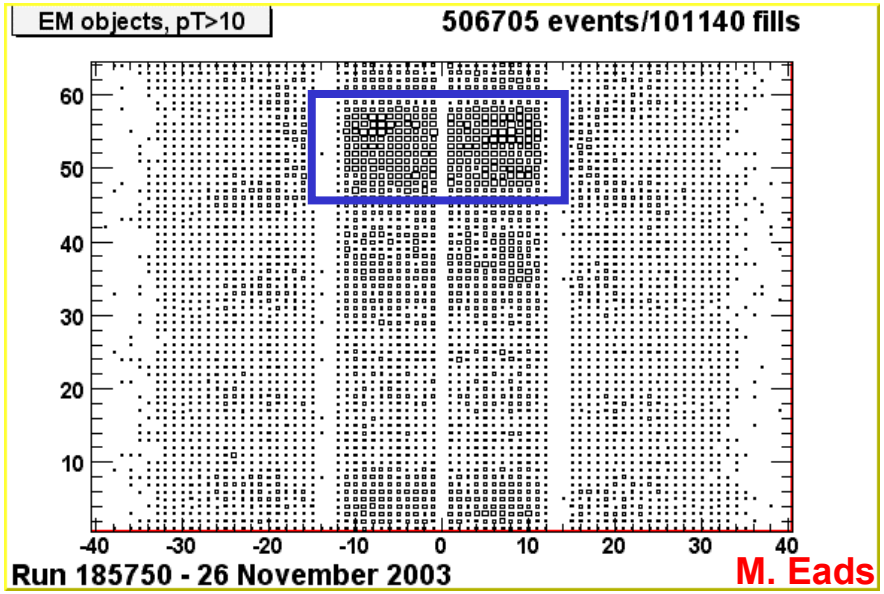
Statistical analysis of em-candidates
Black dots:
electron candidates
Dashed green lines:
blocks of 2x2 towers

Colours: approximate probability that we are seeing a deficit of candidates in a given tower.
white or cold colours ⇒ low probability
warm colours ⇒ high probability



Loose BLS power plug. Fixed now !

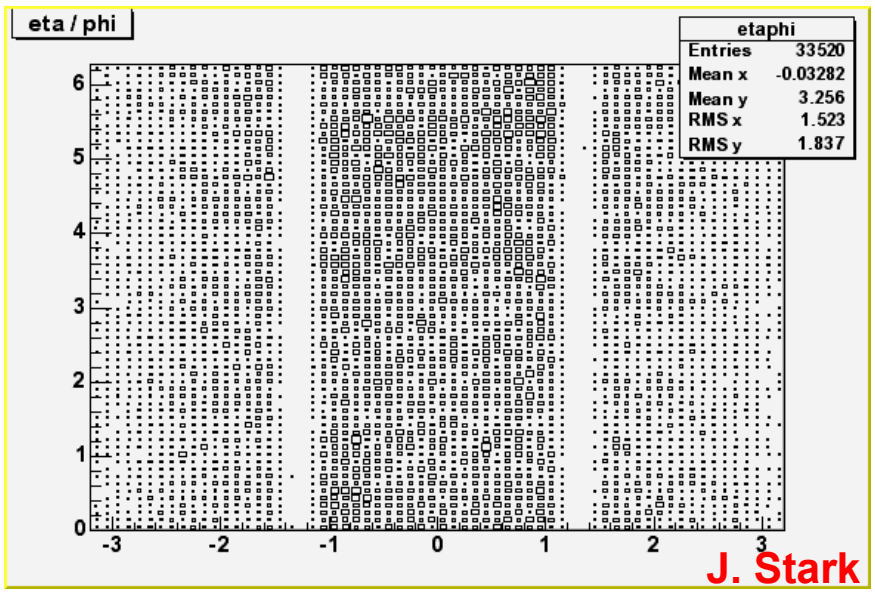
em-objects/em-candidates



spatial distribution of em-objects:

- pT>10GeV

⇒ high occupancy in CC at 45<iphi<64



- **not observed when requiring id=|10,11|**
- **id-criteria for calorimeter-based em-selection**

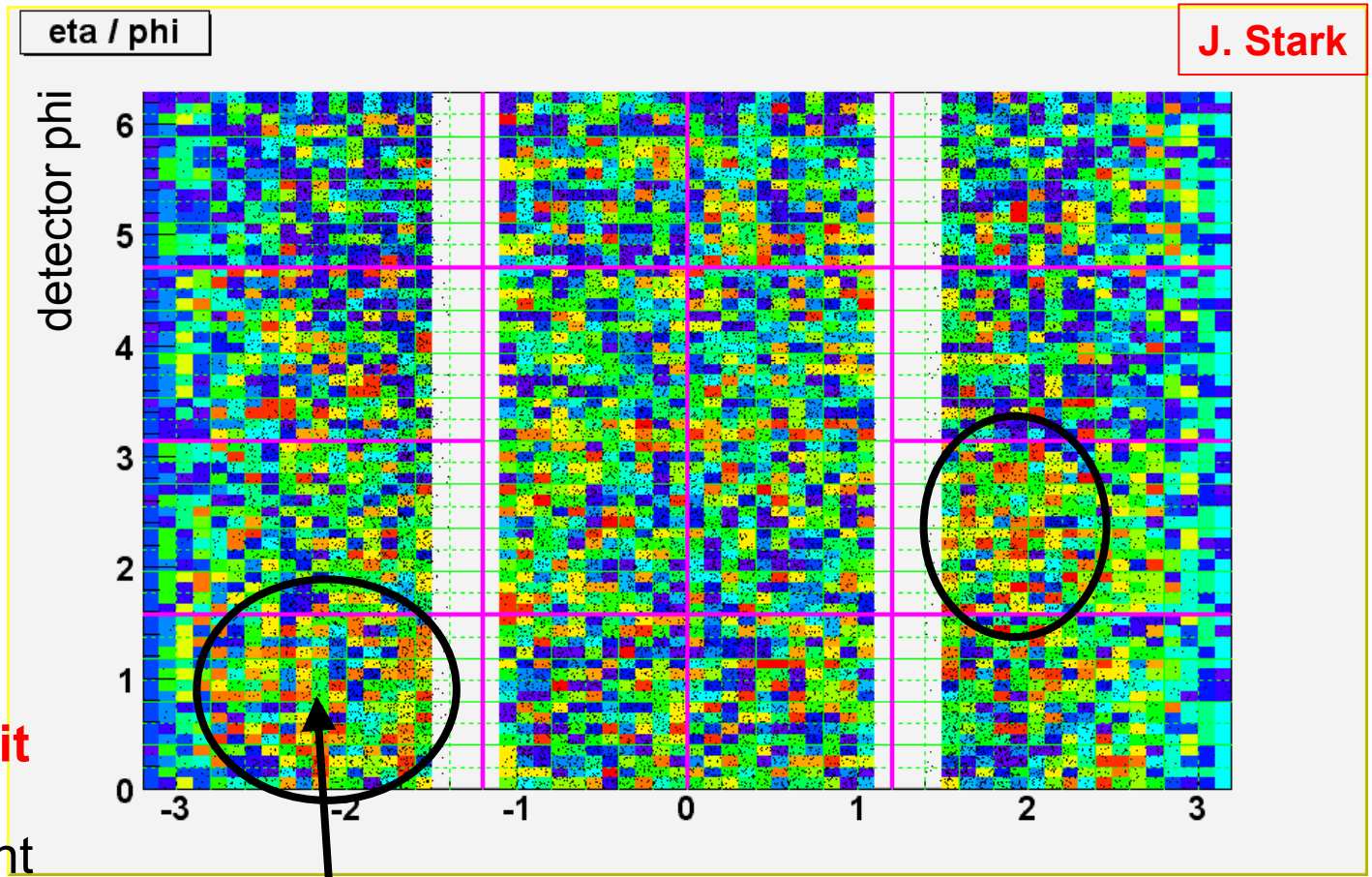
⇒ without id requirement track based em-selection included

⇒ CFT-mapping error!

statistical analysis of em's

runs:
185750
185751
185797
185825
185829
185831
⇒L=362nb^{-1}
~ 39 k ems

- dots for ems
- colors for **"deficit probability":** taking into account eta-dependence of expected occupancy



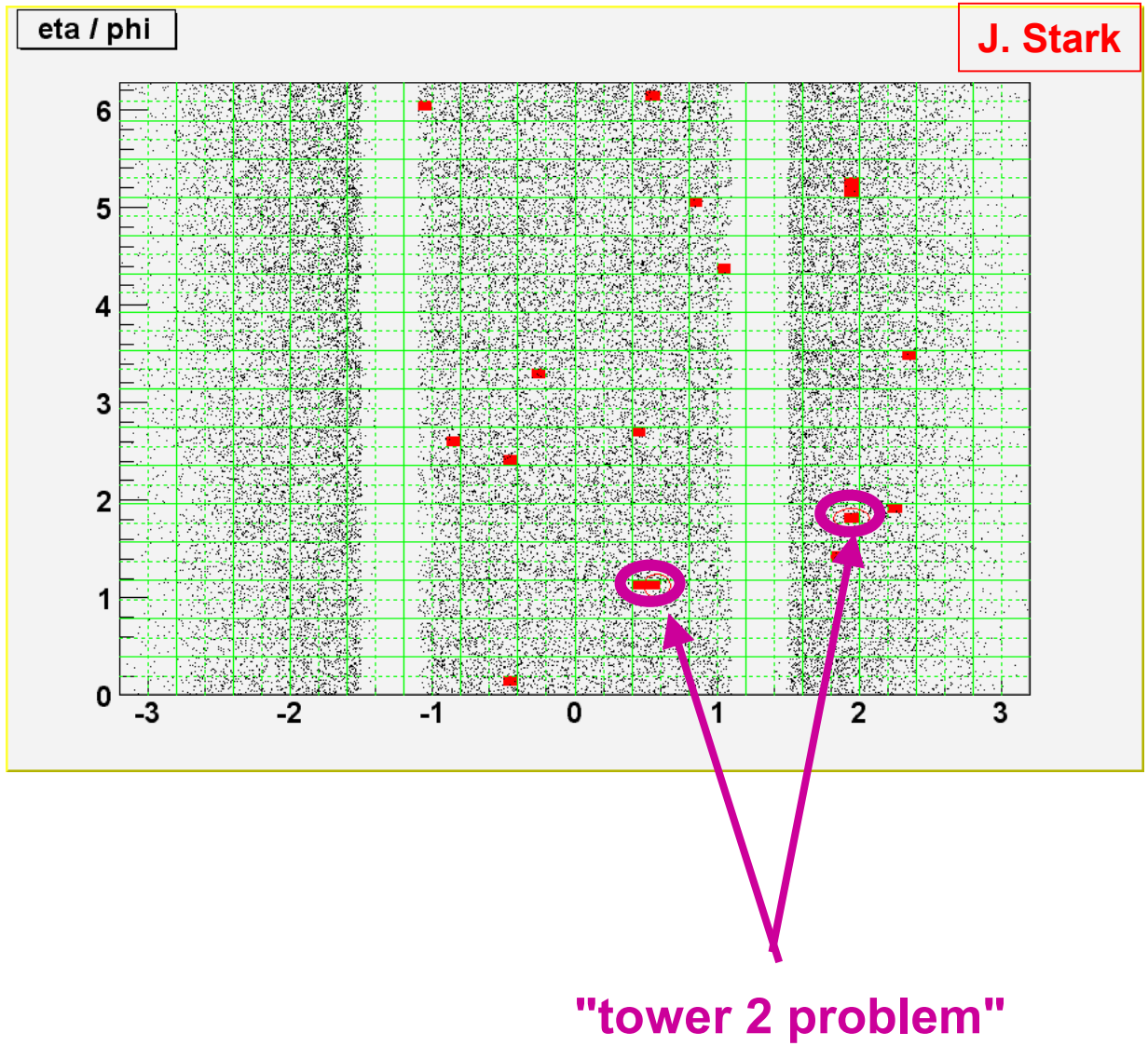
checkerboard structure in pre-shutdown

⇒overall reasonable!

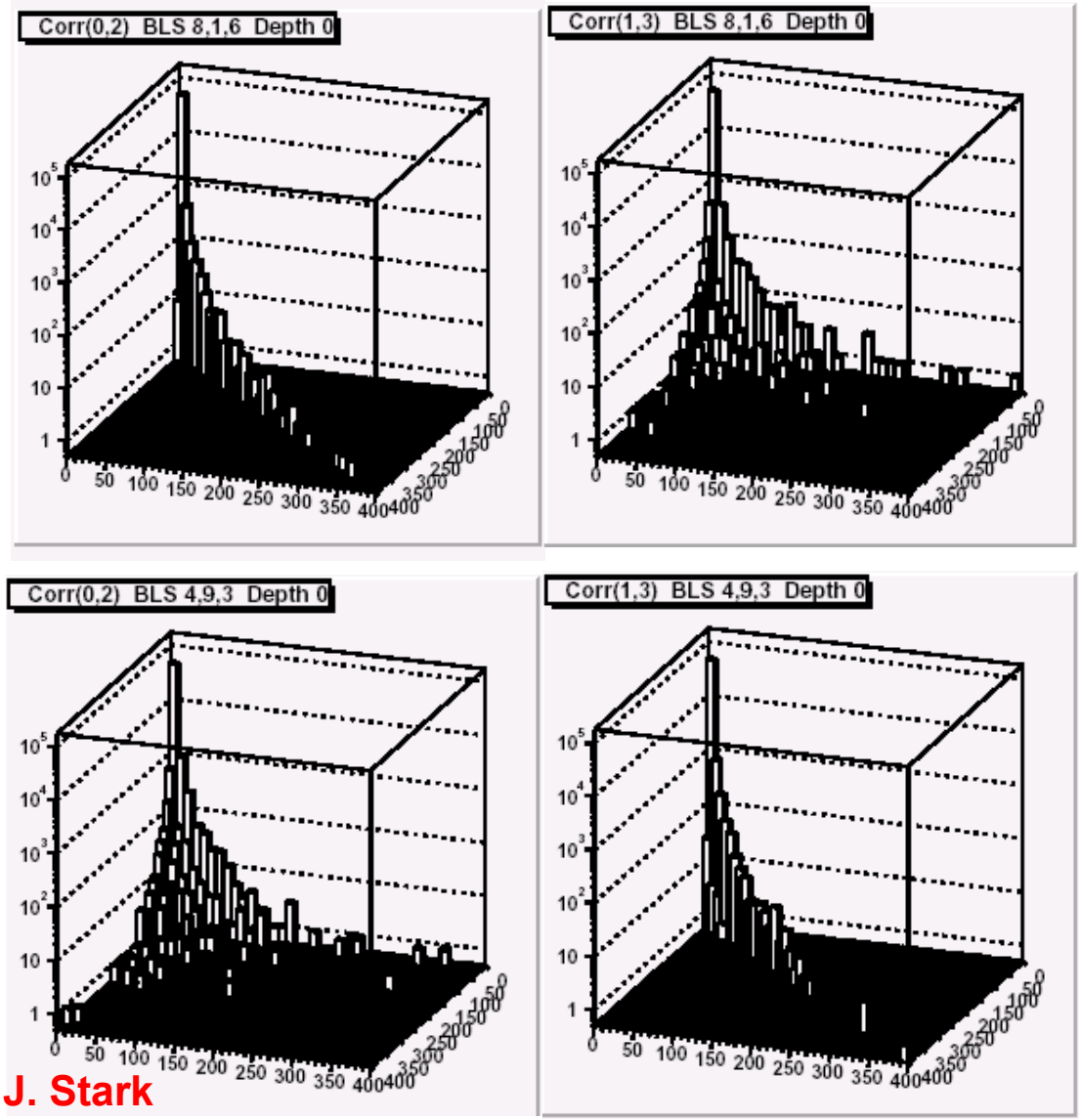
high deficit regions

only towers with a **deficit probability > 0.998**

- 17 towers observed
- 7 towers expected from statistical fluctuations
- **2 explained by "tower 2 problem"**
- **8 towers un-explained!** …which ones?



"Tower 2" problems



J. Stark

Tower 2 problem of BLS boards:

- correlation between odd/even towers on one BLS-board
- checked for all 1152 boards
- confirmed by pulser runs
- fixed

pre/post comparison

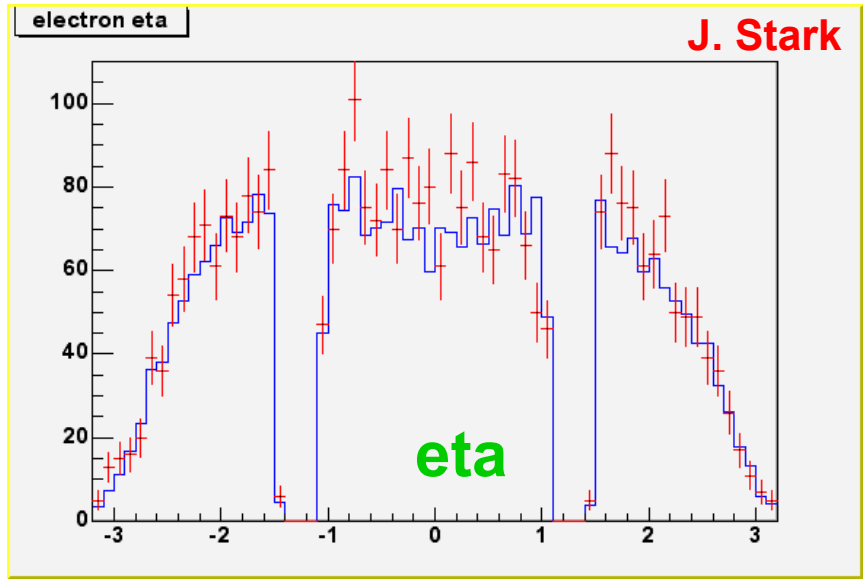
Trigger: E1/2/3_2SH8

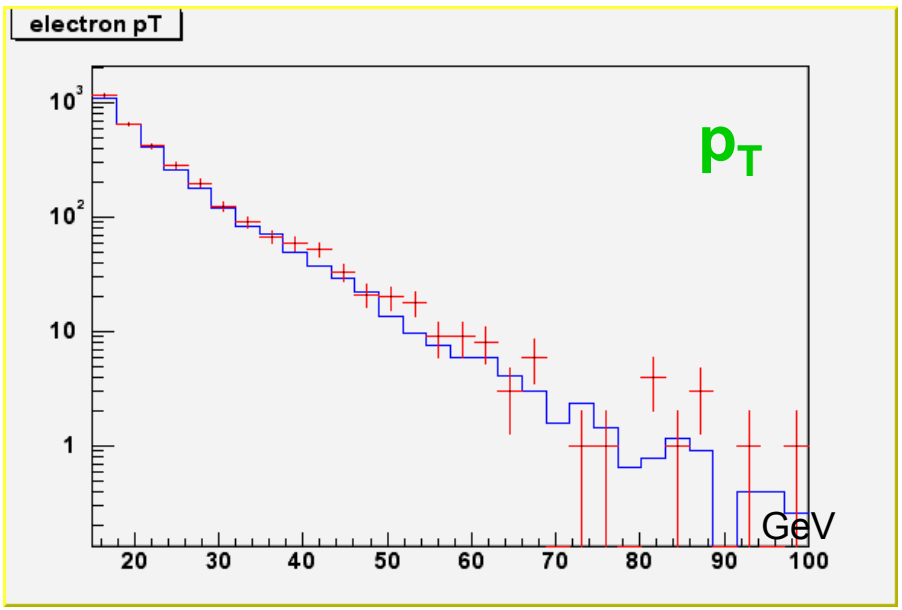
Blue histogram:
2.8 pb^{-1} of good runs taken right before the shutdown.

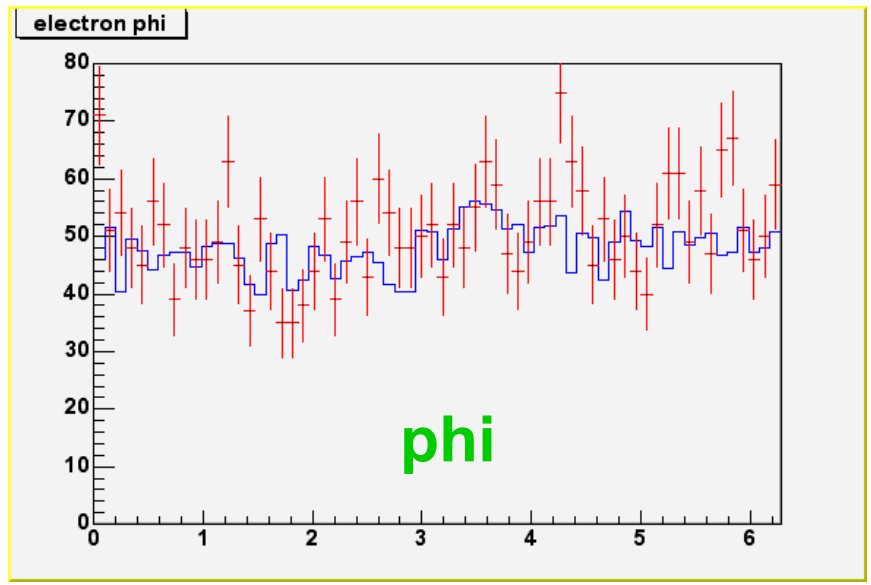
Red points: 362nb^{-1} after shutdown

⇒ normalisation according to integrated luminosity

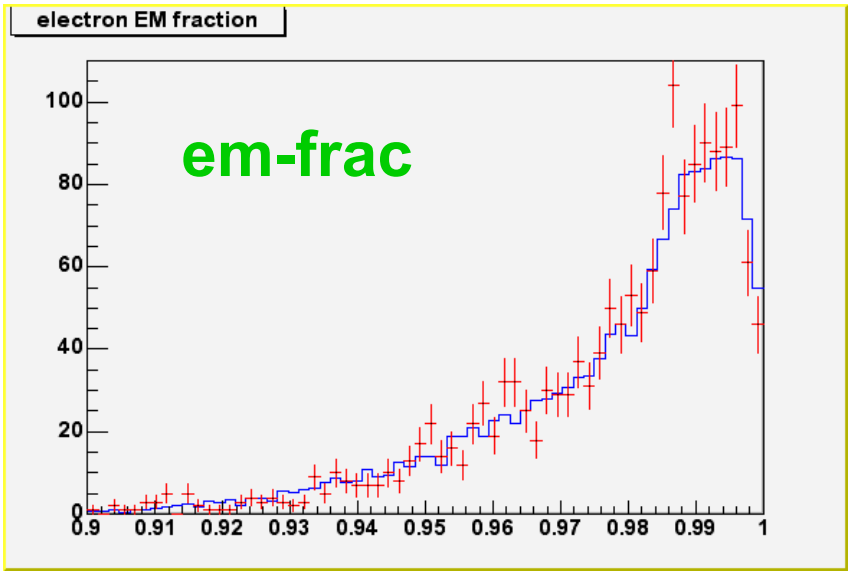
⇒ not to the same surface !

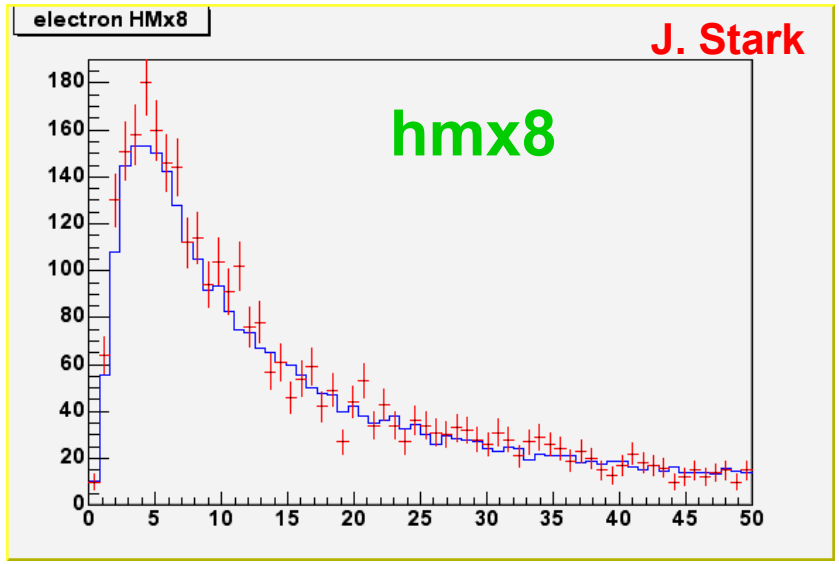






pre/post comparison



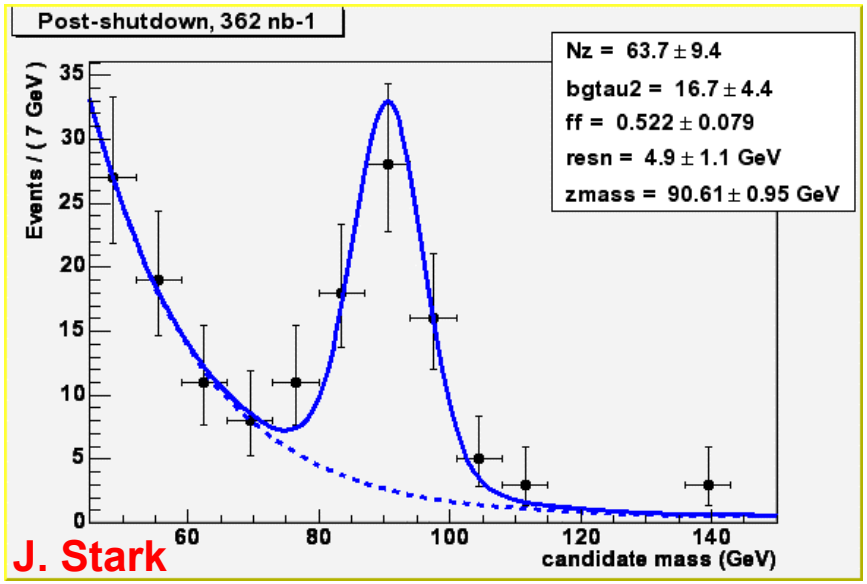


- basic kinematical distributions and estimators are compatible with pre-shutdown data
- event-rate looks fine

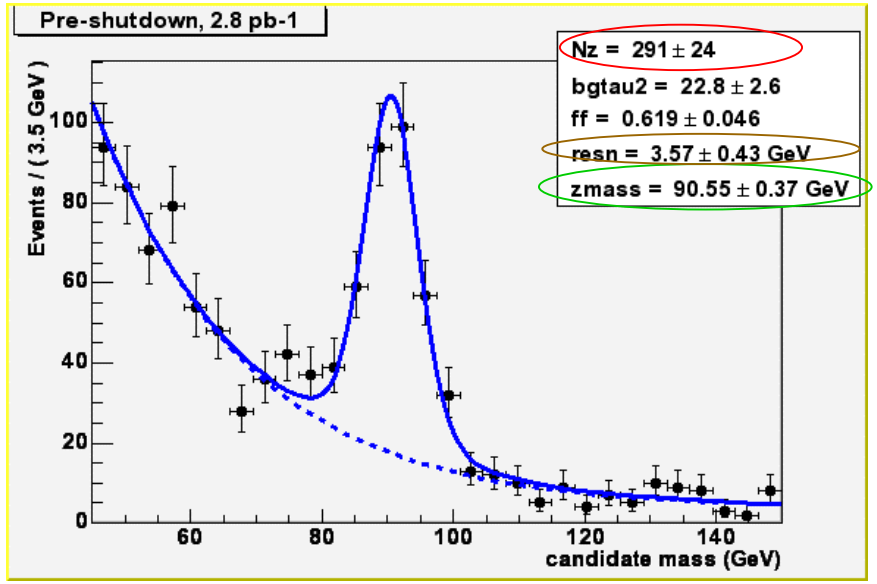
$Z \rightarrow e^+e^-$ comparison

selection: no fiducial region requirement

362 nb^{-1} post-shutdown data



2.8 pb^{-1} "late" pre-shutdown data



likelihood fit with voigtian-distribution: natural width (from pdg) doesn't appear in resolution (5.4 ±1.1% vs. 3.9 ± 0.5%)

signal events: 63.7 ± 9.4 $\Rightarrow$ 38.2 ± 3.9 events expected from old data

resolution high by ~1σ, yield high by ~2σ

MET comparisons

Data Samples

- pre-shutdown : 111 runs processed with p14.03.02

  runs 180040 →180956 -14712 lumi blocks

- post-shutdown : 9 runs processed with p14.05.02

  runs 185746 → 185831 - 986 lumi blocks

- apply luminosity block selection :

- **number of events > 500**
- **SHIFT-METbxy = $\sqrt{(\langle \text{METbx} \rangle^2 + \langle \text{METby} \rangle^2)}$ < 4 GeV**
- **RMS-METbxy = $\sqrt{(\sigma\text{-METbx}^2 + \sigma\text{-METby}^2)}$ < 22 GeV**
- **$\langle$SETb$\rangle$> 80 GeV**

After selection, keep :

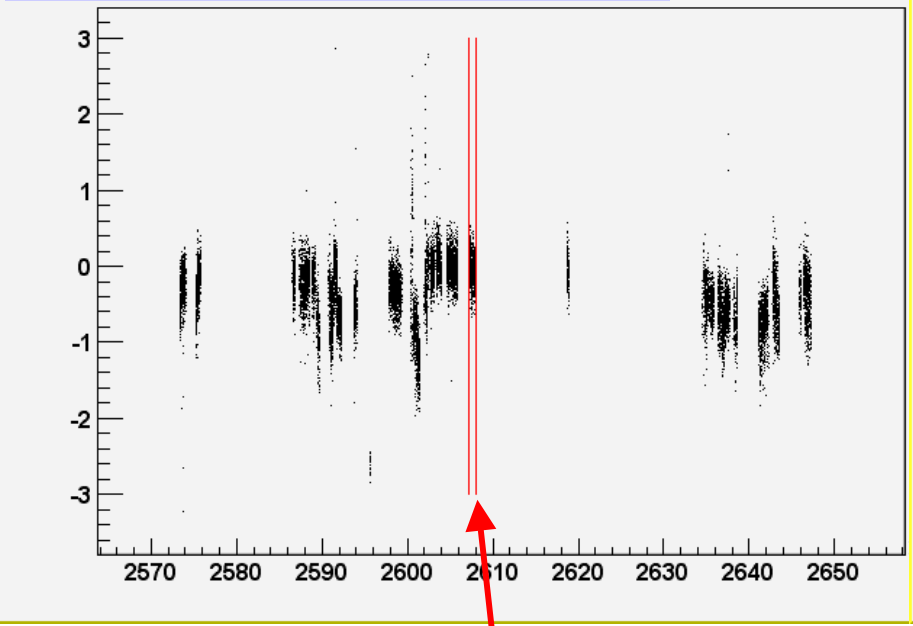
14200 (96,5 %) lumi blocks for pre-shutdown data (~31.8 Mevts)

929 (94,2 %) lumi blocks for post-shutdown data (~2.0 Mevts)

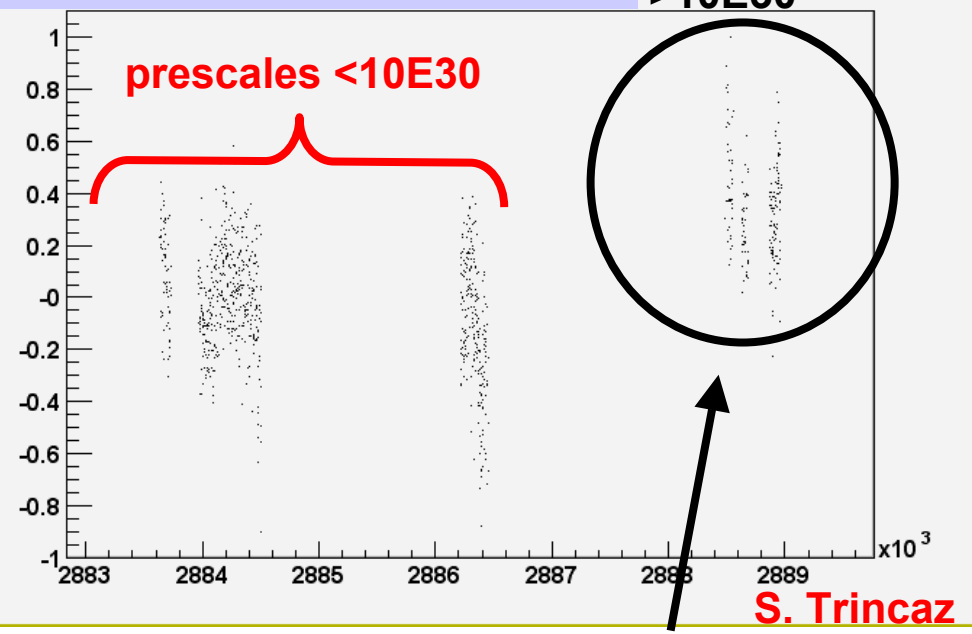
METBx vs. lumi-block

- For each lumi block: compute ⟨ ⟩ and σ of METBx, METBy, METB, SETB
- no trigger selection, no T42
- Note that the vertical scale is different!

Pre-shutdown



Post-shutdown



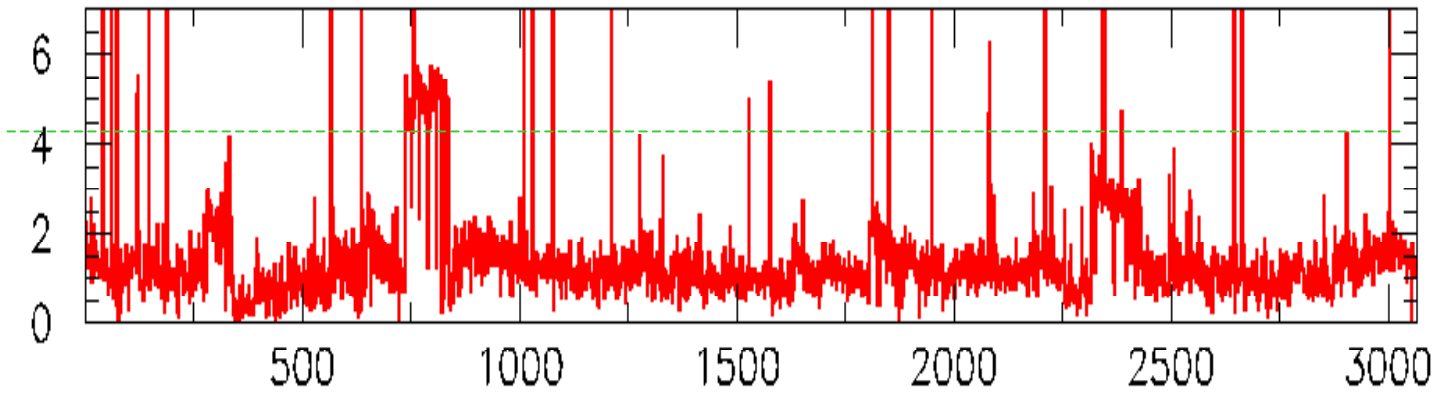
This range (180520<run<180540) has ~same stat and ~same aspect than post-shutdown data. It is used for more detailed comparisons

runs 185825, 185829,185831 have a different MET behavior (in red on next plots)

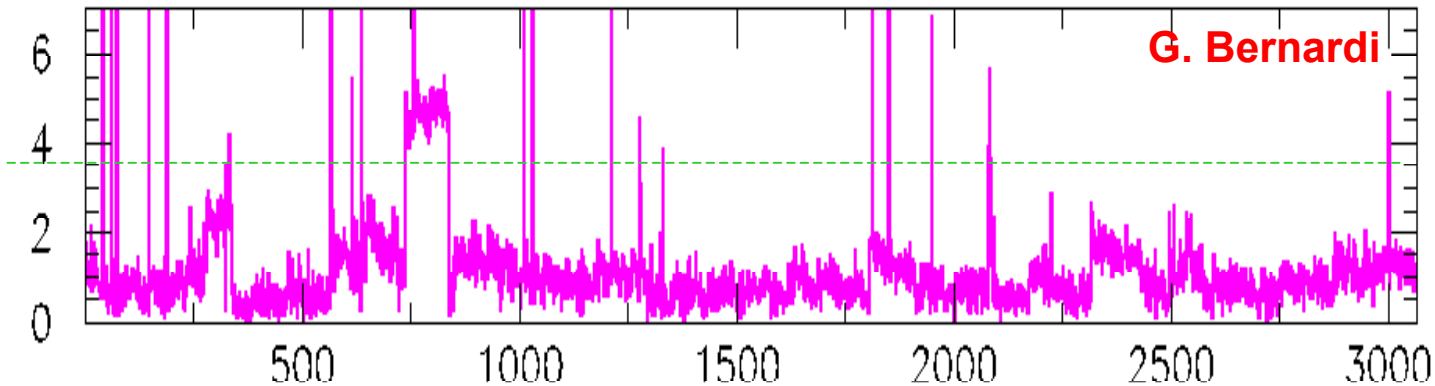
T42: pre-shutdown - Metx

Side-remark: T42 helps to reduce fluctuations in Met x/y !

Met-xy Shift P14.03.02



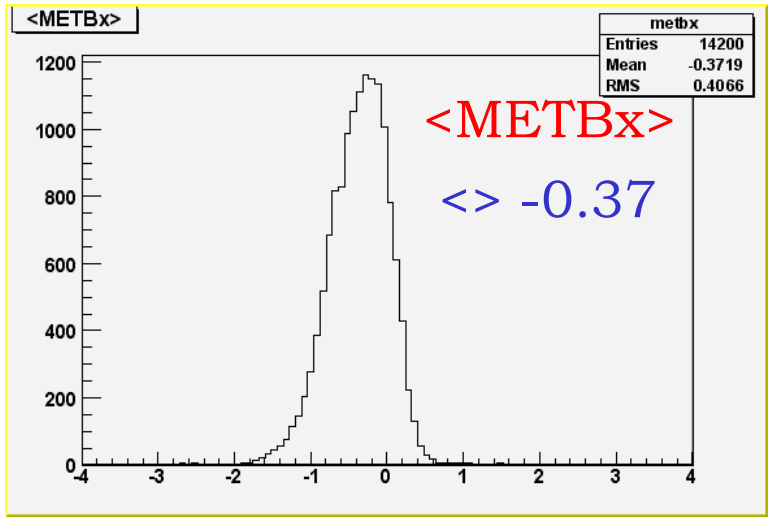
Met-xy Shift same data with T42

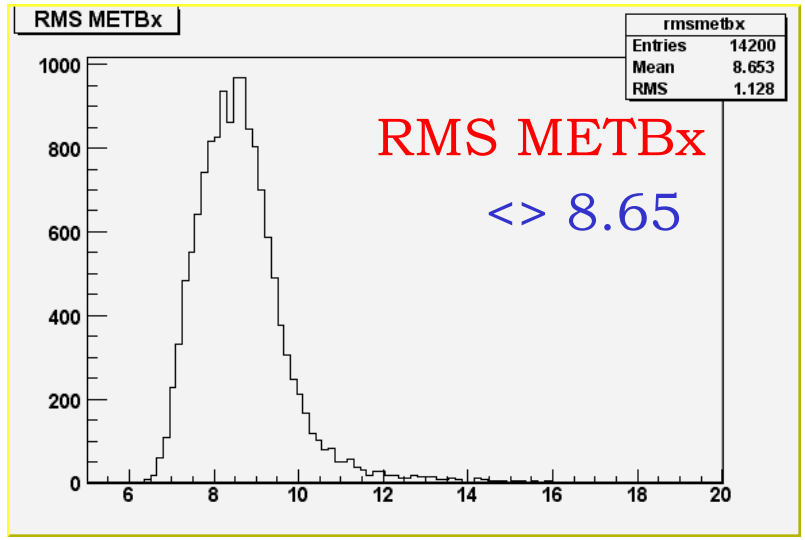


One entry= 1 file or 20 lumi blocks

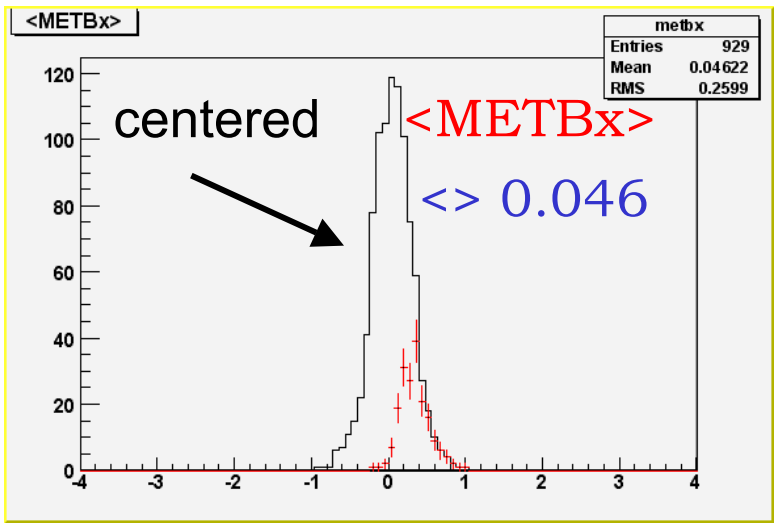
METBx

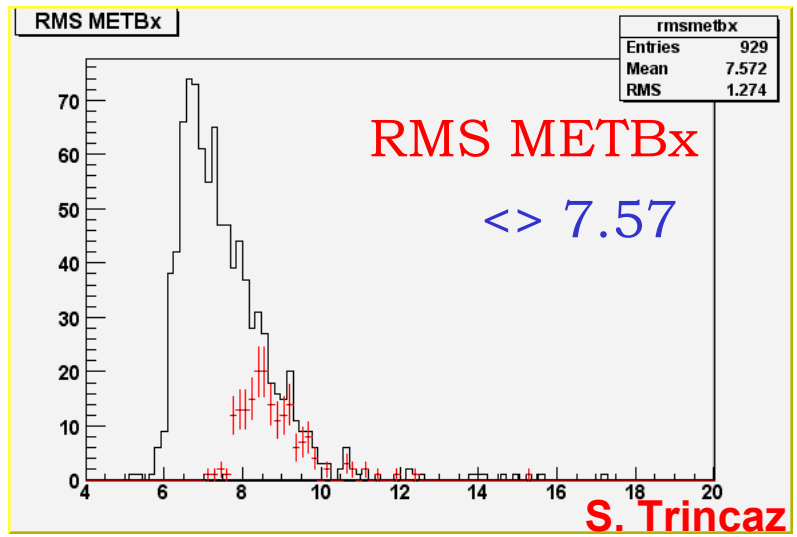
Pre-shutdown





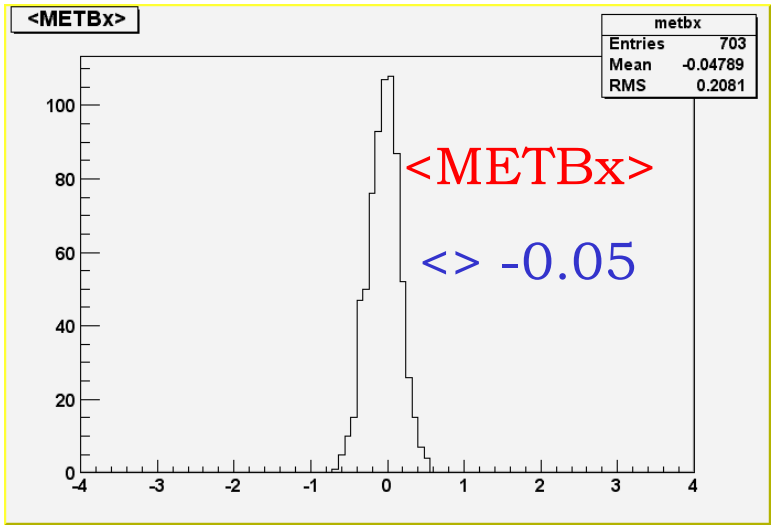
Post-shutdown

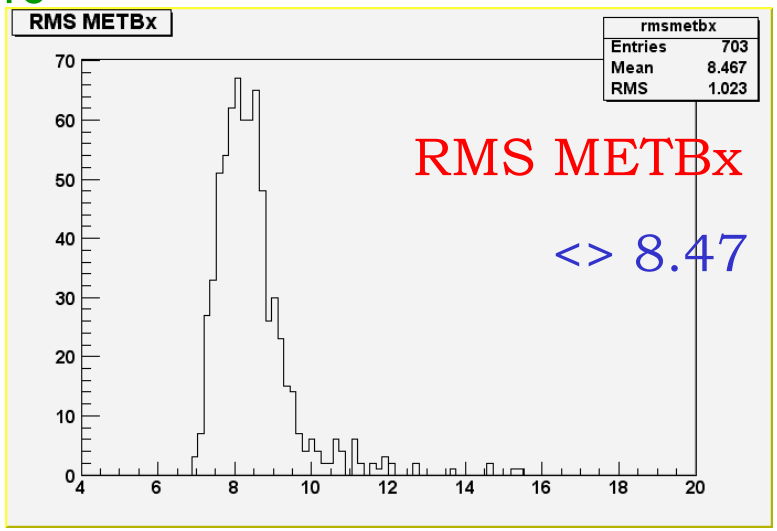




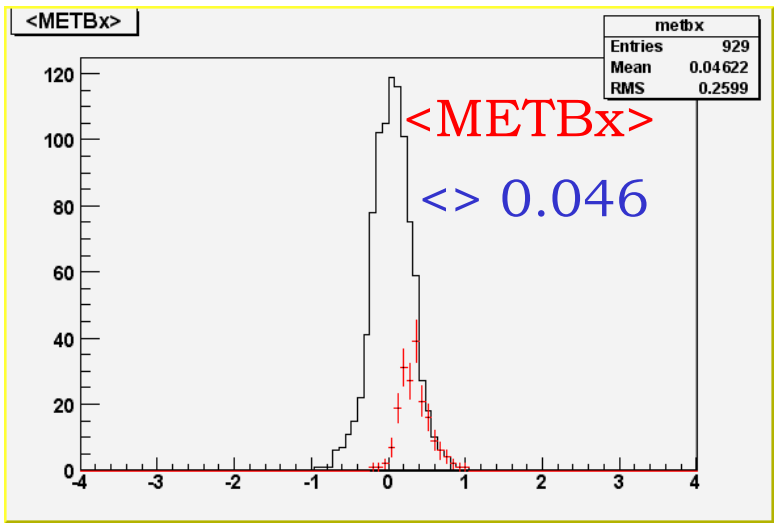
METBx: compatible Runs

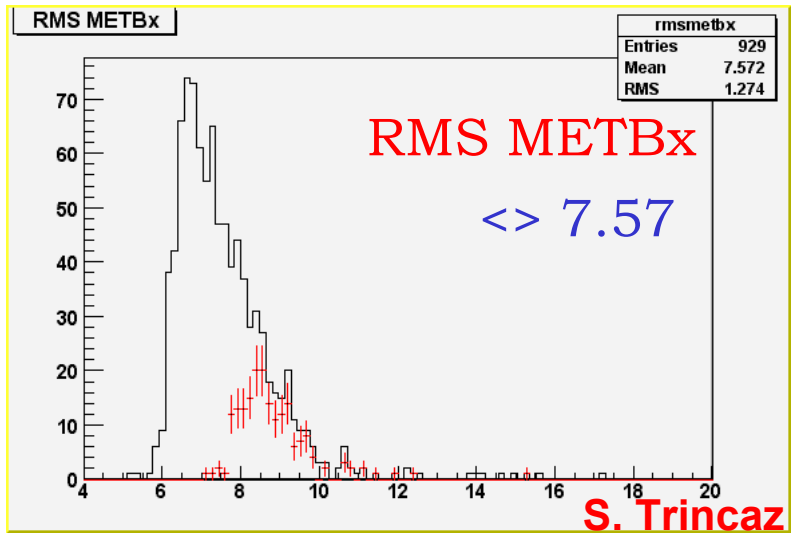
Pre-shutdown – Runs 180520-180540





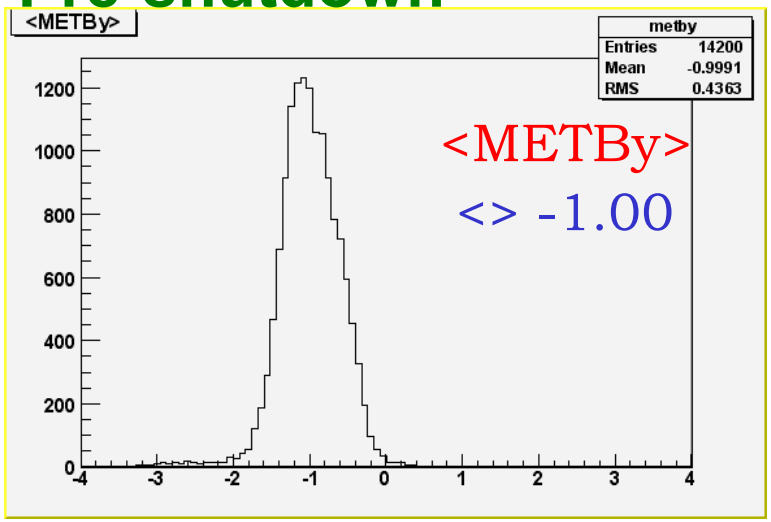
Post-shutdown

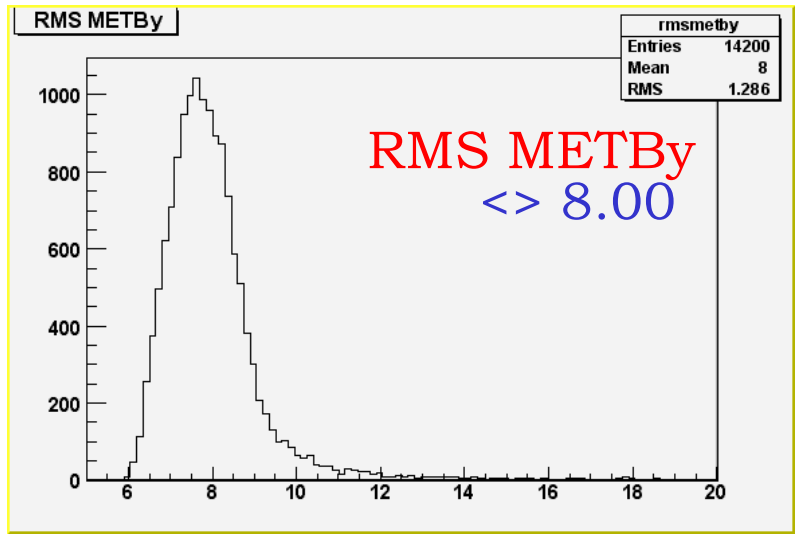




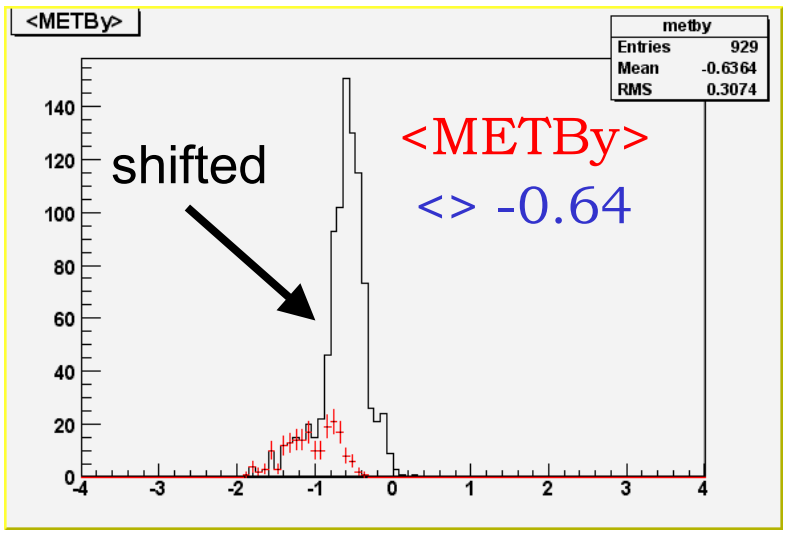
METBy

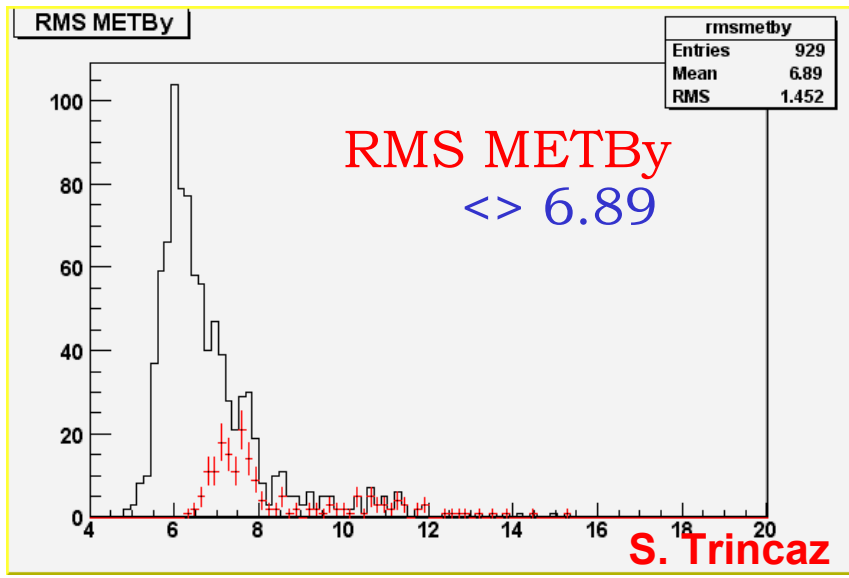
Pre-shutdown



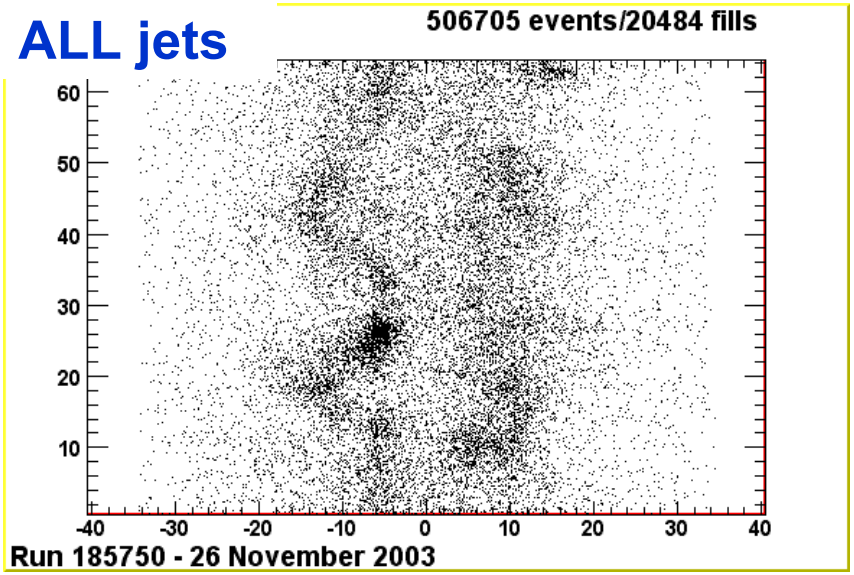


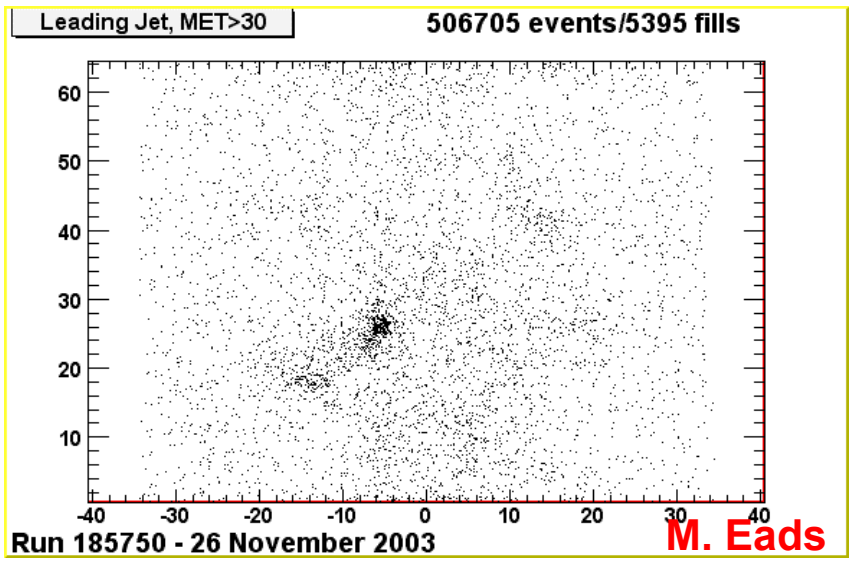
Post-shutdown





JETS





- Structure in Jet eta/phi distribution already present in pre-shutdown data ("Yuri's Jet")
- vanishes after jet-id cuts
- under study to find criteria that cleans up the distributions and may give hint of the origine of these jets

Summary

- electron analysis:
  - understand remaining bad towers
  - monitor Z-peak behavior
  - we have to better understand the resolution anyhow
  - get hold of low energy electrons once tracking is fixed
- MET:
  - understand MET-fluctuations – T42, trigger selections
  - shift in METy to be tracked down
- JET
  - investigation for "Yuri's Jets"